NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington, D.C.

NASA Grant NsG-432

SEMI-ANNUAL REPORT OF ACTIVITIES AND EXPENDITURES

1 April 1965 - 30 September 1965

Submitted by

LABORATORY OF
MILLIMETER WAVE PROPAGATION AND ASTRONOMY
a division of EERL
The University of Texas
Austin, Texas

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington, D.C.

NASA Grant NsG-432

SEMI-ANNUAL REPORT OF ACTIVITIES AND EXPENDITURES

1 April 1965 - 30 September 1965

C. W. Tolbert
Director

Submitted by

LABORATORY OF
MILLIMETER WAVE PROPAGATION AND ASTRONOMY

a division of EERL
The University of Texas
Austin, Texas

I. INTRODUCTION

This is the fifth semiannual report covering the period 1 April 1965 through 30 September 1965 of activities at The University of Texas supported by NASA Research Grant NsG-432. The grant (Supplement #2) [redacted] under the direction of Mr. C. W. Tolbert is supporting the investigation of millimeter wavelength electromagnetic radiation from bodies of the solar system. Radiation measurements are being conducted with the 16 foot antenna system installed at the Balcones Research Center by The University of Texas under NASA Contract NASr-87.

The activities during the fifth biannual were:

A. Initiation of observations of 35 Gc and 94 Gc solar radiation

B. Continuation of observations of 35 Gc and 94 Gc lunar radiation

C. Construction of an analyser to process data from the millimeter wavelength telescope

D. Receipt of 100 Gc and 140 Gc radiometer heads with 150 mc intermediate frequency

II. MILLIMETER WAVELENGTH ASTRONOMY FACILITIES

An analyser to process in real time the data from the millimeter telescope, initiated during the fourth biannual, was completed by Mr. J. H. Sizelan. The instrumentation constituted the subject of his Master's thesis[3c].

Radiometer heads (radiometer instrumentations through the second detectors) operating at the frequencies of 100 Gc and 140 Gc with 150 mc intermediate frequency bandwidths were received from the Raytheon Corporation. These radiometers will replace or augment the existing 10 mc intermediate frequency bandwidth radiometers.

Components of the declination axis position indicator were repaired or replaced and the system calibrated by the Datex Corporation. This work was required after the system failed due to the prolonged period of high humidity during the spring and early summer of this year.

III. MILLIMETER WAVELENGTH ASTRONOMICAL OBSERVATIONS

Observations of 35 Gc and 94 Gc solar emission have been conducted by Mr. Kozo Takahashi, a visiting Japanese scientist in residence at the Laboratory between 30 May, 1965, and 30 May, 1966.

Observations of 35 Gc and 94 Gc lunar emission have been conducted by Mr. D. E. Clardy, a doctoral candidate of electrical engineering.

The results of the observations of the Crab and Orion Nebulae were published in Nature[3b]. The results of the observations of Mars, Jupiter and Saturn have been accepted for publication in the Astronomical Journal[6b].

Local weather conditions and noise are limiting the utilization of the millimeter wavelength telescope. The effectiveness of the telescope as an operational scientific instrument could be greatly improved if relocated in a more favorable climate such as that associated with the area of the McDonald Observatory.

IV. SCHEDULE OF ACTIVITIES DURING THE SIXTH BIANNUAL

The solar and lunar observations will continue through the sixth biannual. Further observations of the Orion Nebula will be conducted when the nebula is near the meridian at a time favorable for optical confirmation of the antenna pointing. Further observations of the planets of the solar system will be conducted when the new radiometer heads are in operation.

V. REPORTS AND PUBLICATIONS

Technical Reports

1a Tolbert, C. W., A. W. Straiton and L. C. Krause, "A 16-Foot Diameter Millimeter Wavelength Antenna System, Its Characteristics and Its Applications," NsG-432, Technical Report No. 1, EERL Report I-01, The University of Texas, March 15, 1964.

2a Tolbert, C. W. and A. W. Straiton, "An Investigation of 35 Gc, 70 Gc, and 94 Gc Cytherean Radiation," NsG-432, Technical Report No. 2, EERL Report I-02, The University of Texas, 15 October 1964.

Publications

1b Galloway, D. G. and C. W. Tolbert, "A Germanium Bolometer Detector of Millimeter Wavelength Thermal Energy," Rev. Sci. Instr., Vol. 35, No. 5, pp. 628-630, May 1964.
Additament, July 21, 1964.

2b Tolbert, C. W., L. C. Krause and A. W. Straiton, "Solar Radiation at 3.2 mm During the 20 July 1963 Eclipse," Astrophy. J., Vol. 140, No. 1, pp. 306-312, July 1, 1964.

3b Tolbert, C. W. and A. W. Straiton, "An Investigation of 35 Gc, 70 Gc and 94 Gc Cytherean Radiation," Nature, Vol. 204, No. 1242, 26 December 1964.

4b Tolbert, C. W., A. W. Straiton and L. C. Krause, "A 16-Foot Diameter Millimeter Wavelength Antenna System, Its Characteristics and Its Applications," IEEE Trans. on Antennas and Propagation, Vol. AP-13, No. 2, pp. 225-229, March 1965.

5b Tolbert, C. W., "Millimeter Wavelength Spectra of the Crab and Orion Nebulae," Nature, Vol. 206, No. 4991, pp. 1304-1307, 26 June 1965.

6b C. W. Tolbert, "Observed Millimeter Wavelength Brightness Temperatures of Mars, Jupiter and Saturn" Astron. J., accepted for publication.

Theses

1c Galloway, D. G., "An Evaluation of the Texas Instrument's Germanium Bolometer at Millimeter Radio - Frequency Wavelengths," Master of Science in Electrical Engineering Thesis, The University of Texas, January 1964.

2c Vivian, R. A., "A Low-Noise 100-MC Bandwidth Transistorized I-F Amplifier for Radio Astronomy," Master of Science in Electrical Engineering Thesis, The University of Texas, August 1964.

3c Sizelan, J.H., "Radio Astronomy Signal Spectrum Analyser," Master of Science in Electrical Engineering Thesis, The University of Texas, September 1965.